

### **REMARKS**

The Examiner has objected to the specification because various graphs etc. are present in the specification. Applicants requests that this objection be held in abeyance until allowable claims have been indicated.

The Examiner has objected to the specification as failing to provide proper antecedent basis for the claimed subject matter. Applicants have amended the specification to overcome this objection. Accordingly reconsideration and withdrawal of this objection is respectfully requested.

The Examiner has objected to claims 2, 5, and 8 on various informalities. Applicants have amended these claims to overcome the objections. Accordingly reconsideration and withdrawal of the objections to these claims is respectfully requested.

The Examiner has objected to claims 9-15 under 35 U.S.C. § 112 as being indefinite. Applicants have amended these claims to particularly point out the subject matter regarded as the invention, accordingly reconsideration and withdrawal of the 35 U.S.C. § 112 rejection is respectfully requested.

The Examiner has rejected all of applicants claims under 35 U.S.C. § 102 as being anticipated by Henriksen or Dahlgren, or Hager, or Japan 11-000904. The Examiner has further rejected various claims under 35 U.S.C. § 103 over Henriksen in view of Dahlgren, Dahlgren individually, and Hager individually. As discussed below none of these references anticipate applicants present claims, nor do any combination of these references make obvious applicants present claims. Therefore reconsideration and withdrawal of the 35 U.S.C. § 102 and 103 rejections and a Notice of Allowability is respectfully requested.

### **WO 00/27547**

The Henriksen patent is based entirely on the use of supercritical fluids, specifically liquid carbon dioxide. It uses supercritical fluids to impregnate a wood substance with preservatives and then uses a methodology to reduce the amount of resins extracted from the treated timber during the “drying” process. The patent teaches the use of a co-solvent (in addition to liquid carbon dioxide) and the use of propiconazole and/or tebuconazole.

### **Comparison to Present Application**

- Henriksen teaches a totally non-aqueous system with only two biocides (which only have anti-fungal activity).
- The only similarity between the present application and the Henriksen patent is that both claim the use of propiconazole and/or tebuconazole. Although carbon dioxide is important for both the present application and the Henriksen patent, the reason for addition/use are quite different. The present application uses small amount carbon dioxide for pH adjustment of an aqueous preservative treatment solution that also contains an organic amine complex of copper. The reference uses a large amount carbon dioxide as the treating medium as well as a solvent for the all-organic preservative system.

### **U.S. Patent 3,976,594**

U.S. Patent 3,976,594, Dahlgren, discloses a preservative formulation designed to be resistant to after glow. When some preservative formulation commonly used to treat utility poles are exposed fire, e.g. grass fire, the pole appears not to catch fire. However, the chemicals within the pole, such as copper as described by Dahlgren, initiate a no-flame, glow reaction, which results in combustion of the entire pole. At the time this patent was issued chromated copper arsenate (CCA) was the most commonly used copper based preservative. Both copper and arsenic are required to give broad-spectrum insect and fungal resistance.

To circumvent this glow problem with copper, Dahlgren discloses a metal pentachlorophenol (PCP) preservative, which has the required broad-spectrum of protection. Dahlgren preferred and claimed metals: cobalt, nickel, copper, zinc and mixtures but preferred are copper and zinc. However, chemistry was required to combine two biocides into a water-soluble mix suitable for impregnation into dried timber. To accomplish this ammonia was selected to form the ammonia metal complexes ( $\text{Cu}(\text{NH}_3)_4^{2+}$  and  $\text{Zn}(\text{NH}_3)_4^{2+}$  for copper and zinc, respectively), as well as to solublize the water insoluble PCP, forming the ammonium pentachlorophenate. Dahlgren teaches and claims that an organic amine, specifically monoethanolamineone may be substituted for one-half the ammonia in the formulation. To add in the metal dissolution process as well as to reduce the glow even further, acidic phosphates/polyphosphates are claimed.

To overcome the problem of vast differences in the acidity/basicity of the wood (pH = 5) and metal PCP formulation (pH = 9-10), carbon dioxide is added, such that the resulting pH is 8.5 or less. This difference between the wood pH and the formulation is sufficient to cause the pentachlorophenolate ion to react with the protons in wood and cause precipitation of the water insoluble pentachlorophenol. This addition results in a "buffer solution" being added to the formulation, which is required to prevent this latter reaction from occurring.

#### **Comparison to Present Application**

- Only copper is disclosed in the present application; no other metals are mentioned.
- Only organic amines such as ethanolamine/monoethanolamine are disclosed as solubilizing agents for copper. Ammonia is not mentioned in the present application.
- Dahlgren claims a mole ratio of amine:carbon dioxide in the range 1 to 4; whereas from equation on page 5 of the present application the amine:carbon dioxide mole ratio is 8 to 1 (or if 3.5 moles of monoethanolamine are used per copper: the ratio is 7 to 1).
- Dahlgren teaches that the pH of the formulation must be between 8 and 8.5. The present application discloses a pH in the preferred range of about 9.5. Since pH is expressed as a logarithm function, the acidity expressed is more than 10 times that taught in Dahlgren.
- The present application is directed to preservative penetration into a wood substrate and limiting the decomposition of moldicides used with the preservative: shows these improvements in examples and claims these improvements. Whereas no such teachings or claims are present in 3,976,594: only anti-glow and solubilizing of the biocides are taught by Dahlgren.

#### **U.S. Patent 4,287,239**

Hager discloses preservative penetration of solutions of copper oxide, chromium trioxide and arsenic pentoxide by the addition of ammonia and ammonium bicarbonate. At the time of the Hager patent, chromated copper arsenate (CCA) was the common and preferred wood preservative formulation. Typically, it is expressed in an oxide format as shown in the first table in Hager: 19.6, 35.3 and 45.1 percent for CuO, CrO<sub>3</sub> and As<sub>2</sub>O<sub>5</sub>, respectively for CCA Type B.

It is well known in the wood treating industry that acidic wood treatment solutions are limited in their ability to penetrate certain refractory wood species. It is also well known that if no reaction occurs with the wood preservative formulation and the wood chemical that

keeping the wood for prolonged periods of time (2 to 4 weeks) can enhance preservative penetration due to diffusion. Thus, Hager teaches the addition of ammonia and ammonium bicarbonate to a modified mixture of oxides of copper, chromium and arsenic, where the copper content has been increased over the worldwide accepted/approved amount as shown for CCA-B above. On a 100 percent basis the percent CuO, CrO<sub>3</sub> and As<sub>2</sub>O<sub>5</sub> are calculated as 48.2, 25.9 and 25.9 respectively. Hager also claims that the temperature of the wood to be treated by the claimed preservative formulation must be in the range of 80 to 110 ° C.

#### **Comparison to Present Application**

- After treatment Hager requires that the treated wood must be maintained in a warm condition and undried for at least 2-weeks. This is to improve the penetration of his preservative formulation. (See Claims 1 and 4.) The present claims do not require the untreated wood to be heated or the subsequently preservative treated wood to be held in a warmed, undried condition for a minimum period of 2-weeks. The Hager formulation and treatment process is also not commercially acceptable.
- Hager claims the treated, wet-conditioned wood must then be dried to initiate the preservative fixation process (Claim 1). This again is commercially undesirable since it adds cost and processing time. The present claims do not require that the wood treated with the preservative formulation require any additional fixation/conditioning.
- Hager teaches that the wood must be warmed to a temperature range of 80 to 110 ° C (Claim 3). The present claims do not require any additional heating of the wood to obtain improved penetration of the preservative formulation.
- The ratio of weight percent copper to weight percent carbon dioxide in Hager is 3.0, e.g. for 0.3 % Cu the present application teaches the use of 0.1 % CO<sub>2</sub> (page 5) in the preservative formulation. Hager claims a weight percent Cu to CO<sub>2</sub> ratio of 0.2; even using the highest amount of Cu and the lowest amount of CO<sub>2</sub> the weight percent ratio is 1.0 (Claim 5). Hager teaches and claims the use of a far greater amount of carbon dioxide per copper than in the present application.
- The pH of the Hager formulation must be above the minimum of 8.2 (Claim 9); no upper range is claimed. The present application teaches a pH range of 9 to 10, but preferred is about 9.5. The application teaches that pH values greater than 10 reduce preservative penetration into wood substrates.
- In Claim 14 of the Hager Patent, ammonium bicarbonate is included in the preservative treatment solution. The present application does not disclose the use of ammonia or any of its salts; only organic amines.
- Hager bases preservative penetration improvements on the process of diffusion through cell walls. The present application bases its penetration improvement on the ability to maintain un-obstructed flow through the intercellular wood structure.

#### **JP11000904A**

This reference teaches the use of gaseous and liquid carbon dioxide, added under pressure to a wood preservative or wood modifier. The pressure range is 0.1 to 5 kg/cm<sup>2</sup> for

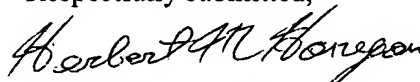
500 mL of treatment liquid. To obtain these pressures, 500 mL of liquid CO<sub>2</sub> is added to 500 mL of treatment liquid. The temperature for processing can range between 10 and 105 ° C. Also, ultrasonic energy (5 – 80 kHz) is applied as the timber and solution undergo warming. In essence, the reference teaches the use of carbon dioxide as a carrier for various wood preserving or modifying chemicals.

#### **Comparison to Application**

- The use of carbon dioxide in JP11000904A is for liquefaction of the wood preservative or modifier. It teaches that CO<sub>2</sub> reduces the surface tension of the formulation such that improved penetration is observed. Additional reduction in surface tension is taught by the applying ultrasonic or “supersonic” waves. Increasing the temperature is also taught to as a means to reduce surface tension. No chemical reaction of carbon dioxide with the preservative or modifier is taught and no pH range is taught.
- The present application claims reaction of carbon dioxide (gaseous) with the aqueous preservative formulation, requires a specific pH, is totally an aqueous system after reaction, uses far lower amounts of carbon dioxide, requires no specific temperature (other than above freezing), and doesn’t apply ultrasonic energy.

In view of the above amendments and remarks reconsideration and withdrawal of the rejections of Applicant’s claims and a Notice of Allowance is respectfully requested.

Respectfully submitted,



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